In the claims:

1. (Original) A seal element for providing a seal between two components in a downhole tool, the seal element comprising:

a polymer host material; and

a nanomaterial integrated with the polymer host material to form a nanocomposite material.

2. (Original) The seal element as recited in claim 1 wherein the seal element comprises a seal selected from the group consisting of O-ring seals, D-seals, T-seals, V-seals, X-seals, flat seals, lip seals, back-up rings, bonded seals and packing elements.

3. (Original) The seal element as recited in claim 1 wherein the polymer host material is selected from the group consisting of elastomers, thermosets and thermoplastics.

4. (Original) The seal element as recited in claim 1 wherein the polymer host material comprises an elastomer selected from the group consisting of NBR, XNBR, HNBR, XHNBR, HXNBR, HSN, EPR, EPDM, FEPM, FKM and FEKM.

5. (Original) The seal element as recited in claim 1 wherein the polymer host material comprises a thermoplastic selected from the group consisting of polphenylene sulfides, polyetheretherketones and tetrafluoroethylenes.

6. (Original) The seal element as recited in claim 1 wherein the nanocomposite material further comprising a reinforcement material selected from the group consisting of powder materials, fiber reinforcement materials and metal reinforcement materials.

7. (Original) The seal element as recited in claim 1 wherein the nanomaterial further comprises nanoparticles having a scale in the range of approximately 0.1 nanometer to approximately 500 nanometers.

8. (Original) The seal element as recited in claim 1 wherein the nanomaterial is selected from the group consisting of metal oxides, nanoclays and carbon nanostructures.

9. (Original) The seal element as recited in claim 1 wherein the nanomaterial further comprises silicon.

10. (Original) The seal element as recited in claim 1 wherein the nanomaterial is selected from the group consisting of polysilane resins, polycarbosilane resins, polysilsesquioxane resins and polyhedral oligomeric silsesquioxane resins.

11. (Original) The seal element as recited in claim 1 wherein the polymer host material and the nanomaterial have interfacial interactions selected from the group consisting of copolymerization, crystallization, van der Waals interactions and cross-linking interactions.

12. - 38. (Cancelled)